

## UPM Biofuels – commercial plant in Lappeenranta, Finland

Lab scale

Bench scale

Pilot Plant

Demonstration

Commercial

### Introduction

UPM plans to become a major player in Europe in the production of renewable, high quality advanced biofuels. UPM produces its advanced biofuel, UPM BioVerno, at the biorefinery in Lappeenranta, Finland, based on its own innovations.

The UPM Lappeenranta Biorefinery, producing wood-based renewable diesel from forestry residues, has started commercial production in January 2015. A significant portion of the raw material used at the UPM Lappeenranta Biorefinery - crude tall oil - comes from UPM's own pulp mills in Finland, such as the UPM Kaukas mill site located next door.

UPM BioVerno is high quality renewable diesel that can be used as a blending component or as 100% fuel in all diesel engines. It reduces greenhouse gas emissions by 80% compared to fossil diesel.

### Technology description

The production of UPM BioVerno renewable diesel from wood-based tall oil is an advanced biofuel production process. This innovative production process has been developed in the UPM Biorefinery Research and Development Centre in Lappeenranta, Finland.

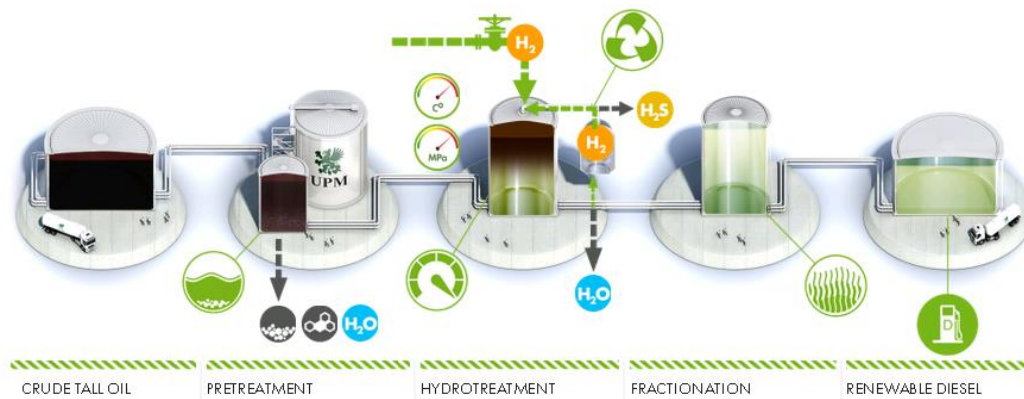
The technology is based on hydrotreatment. Phases are pretreatment of crude tall oil, hydrotreatment, separation of hydrocarbons, recycle gas purification, and fractionation to produce renewable diesel and small portion of renewable naphtha as end products.

- **Pretreatment:**  
Crude Tall Oil is purified; salts, impurities, solid particles and water are removed.
- **Hydrotreatment:**  
Pretreated Crude Tall Oil is fed together with make-up and recycled hydrogen to the reactor where the chemical structure is modified. Reaction water is separated and directed to waste water treatment.
- **Fractionation:**  
Remaining hydrogen sulfide and uncondensable gases are removed. The remaining liquid is distilled to separate renewable diesel suitable for all diesel engines.



### Technical Details

Project owner	UPM Biofuels
Project name	UPM Lappeenranta biorefinery
Location	Lappeenranta, Finland
Technology	Oleo chemical conversion
Raw Material	Wood-based residue of pulp production; tall oil
Product(s)	Renewable diesel similar to HVO
Output Capacity	100,000 t/y or 120 million litres/y
Facility type	Commercial
Total Investment	175,000,000 EUR
Status	Operational
Start-up Year	January 2015
Web	<a href="http://www.upmbiofuels.com">http://www.upmbiofuels.com</a>



UPM – flow chart of UPM Lappeenranta biorefinery

## Project background

In 2008, with the popularity of printing paper declining, UPM decided to transform itself in a bold way and look for new businesses. Biofuels was a prevalent trend and UPM had suitable wood-based residue available from their own pulp production as feedstock. Product development of wood-based UPM BioVerno diesel started in-house. UPM utilized its 120 years of experience in making products from wood at its site in Lappeenranta.

Investment decision to build the world's first biorefinery producing wood-based renewable diesel was made in February 2012. Construction of the biorefinery started during summer 2012 in Lappeenranta, Finland. UPM's total investment cost for the renewable diesel biorefinery is about EUR 175 million and was completed without any public investment grants. NIB is co-financing the project with a 7-year maturity loan of EUR 50 million. The technology to refine tall oil into renewable diesel is based on the company's own innovation and co-operation with Danish catalysis company Haldor Topsøe A/S, another loan customer of NIB. The company's biofuel plant integrates nicely with the pulp and paper plant, saw mill, and research centre at the site. The local resources in know-how, raw materials and energy can be utilized in a way that makes logistical sense.

UPM employs around 21,000 people, its annual sales are approximately EUR 10 billion, and it has production plants in 14 countries. UPM shares are listed on NASDAQ OMX Helsinki

## UPM – More projects

- In advanced biofuels UPM has been developing, together with Andritz Carbona, the **gasification technology** needed to produce biofuel from wood biomass. The initial **testing programme** was completed in the **USA** at the Gas Technology Institute as planned.
- UPM, Metso and Fortum together with the VTT Technical Research Centre of Finland have developed a new concept for the production of **wood biomass-based bio oil** to replace fossil fuels in heating and power generation. Production of bio oil is integrated into biomass-based **power plants**. The long-term goal is to use bio oil for the production of transportation fuel.
- UPM, Fortum and Valmet are jointly developing technology to produce lignocellulosic advanced biofuels. The project is called Lignocat (lignocellulosic fuels by **catalytic pyrolysis**)
- UPM is planning the production of advanced biofuels from wood biomass in a **BtL (Biomass-to-Liquid) refinery** to be constructed in **Strasbourg, France**. The European Union has awarded UPM a NER grant of EUR 170 million for the project.